

NJ Pilot Lake Studies: Cyanobacterial Toxin Monitoring

NJDEP Division of Water Monitoring & Standards
Bureau of Freshwater and Biological Monitoring

Victor Poretti, Section Chief

September 23, 2015



Background

- 2013 - Microcystin Monitoring and Analysis initiated as part of Ambient Lake Monitoring Network. Purchased analysis equipment via EPA Monitoring Initiative Grant.
- Microcystin analysis initially performed 1x year during routine Lake Network sampling for background levels/occurrence. Follow up sampling if HAB detected.
- Limitations:
 - HABs may not occur when routine samples are collected.
 - HABs may be concentrated in areas of lake not sampled routinely.
 - Limited capacity to sample non-network lakes.

Pilot Objectives

- Overall
 - Address limitations in routine monitoring.
 - Develop strategies for action and response
- Pilot 1
 - Target lakes with known re-occurring blooms.
 - Develop monitoring designs that best assess HAB recreational risk.
- Pilot 2
 - Develop cost effective means for lake stewards to screen for HAB risk.

Partners

Targeted Lakes

- Rutgers Cooperative Extension
Burlington/ Camden Counties.

Field Screening

- DEP State Park Service.

Pilot 1: Targeted Lakes

- Smithville Lake – Burlington County
- Hopkins Pond – Camden County
- Lakes identified and monitored previously for HABs by Mike Haberland, Rutgers Cooperative Extension.
- Pilot study on these lakes in partnership with Rutgers Ext.

Design – Sample Sites

- Monitor weekly August – September
- Sample water column (1 meter)
- Sample surface where bloom is concentrated.
- Perform visual site assessments.

NJLM-0031
Smithville Lake
Eastampton Twp, Burlington Co



NJLM-0008
Hopkins Pond
Haddonfield Twp, Camden Co

31-6
Hopkins Lake Dam

Sampling Station

Cooper River tributary

0 0.04 Miles



Design - Parameters

- Cyanotoxins
 - Microcystins
 - Anatoxin-a
 - Cylindrospermopsin
- In situ – DO, pH, Conductivity, Temperature
- Turbidity
- Nutrients
- Chlorophyll a

Design - Cyanotoxin Analysis

- BFBM Lab
 - Microcystins – Enzyme-Linked Immunosorbent Assay (ELISA). Method established through Lake Network.
 - Cylindrospermopsin - ELISA. **New capacity for BFBM.
 - Anatoxin – Receptor-Binding Assay (RBA). **New capacity for BFBM.
- Rutgers Ext
 - Abraxis Qualitative Microcystins Strip Test.
 - Performed in field.
- Rutgers Ext., BFBM Lab
 - Taxa ID (broad scale)

Smithville Lake - Preliminary Findings

- July 2014 contacted by Rutgers Cooperative Extension of Burlington County
- Cooperative contacted County Park to post sign.
- BFBM sampled for microcystins and Chl 'a'.
- High Chl 'a' but low microcystin level.
- *Anabaena* sp. present; some *Anabaena* sp. produce anatoxin and not microcystin.



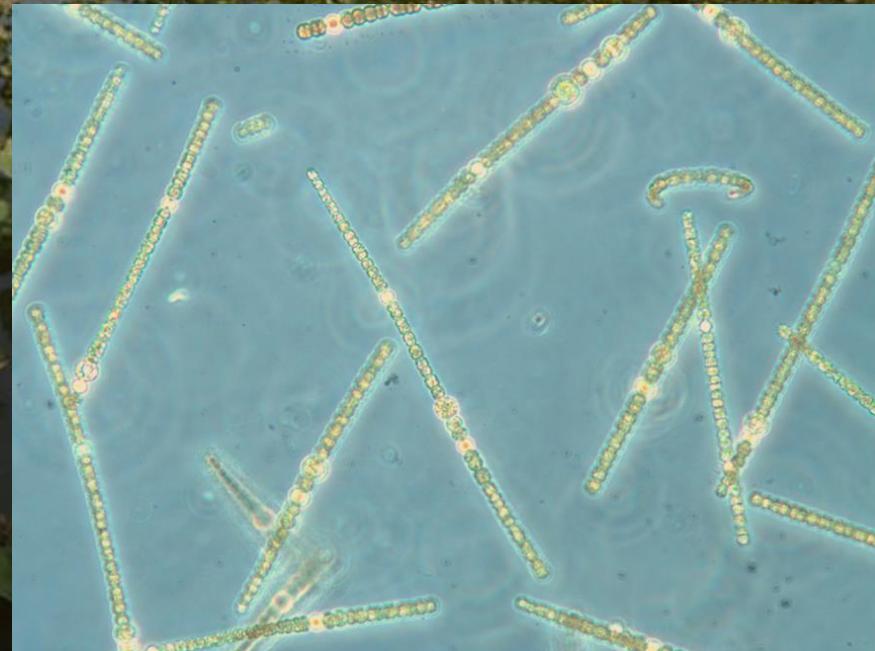
Smithville Lake - Preliminary Findings



Smithville Lake Preliminary Findings



Photos: M. Haberland



Anabaena sp. from Smithville
Lake.

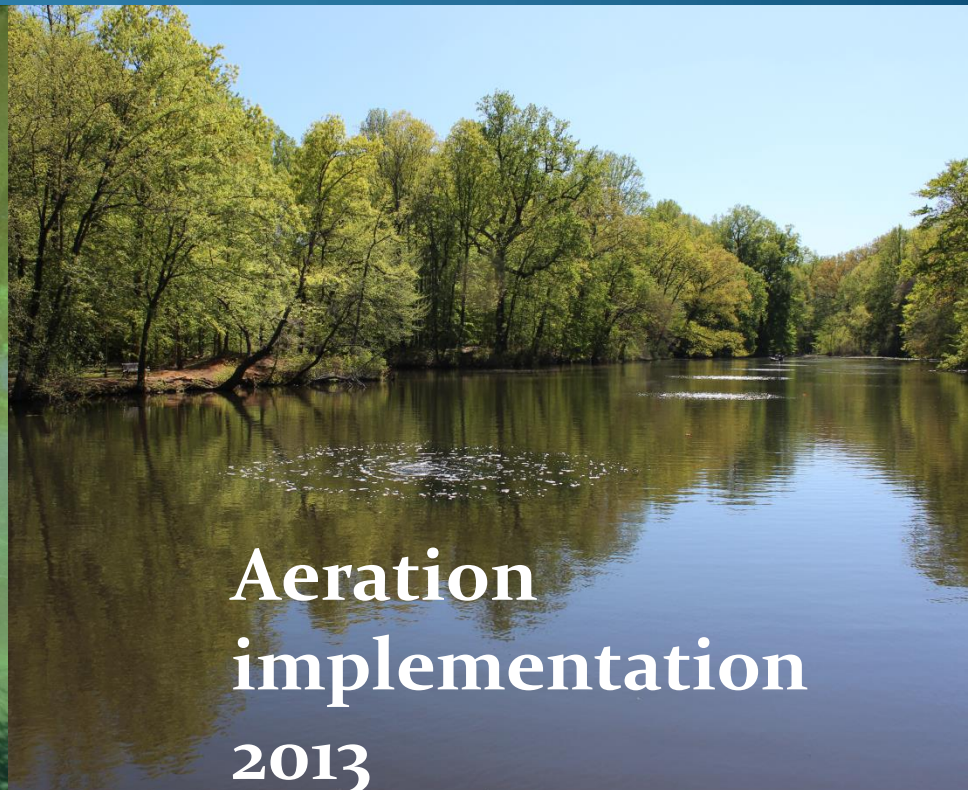
Smithville Lake

Preliminary Findings

- High Chlorophyll a concentrations in water column
 - Up to 185 $\mu\text{g/L}$
- *Anabaena* sp present
- Surface and Water Column
 - No microcystin strip test detection
 - Microcystin lab analysis just above detection
 - No anatoxin or cylindrospermopsin detected
- Nutrient results pending

Hopkins Pond Preliminary Findings

Photos: M. Haberland



Hopkins Pond

Preliminary Findings

- High Chlorophyll a concentrations at surface
 - Up to 252 $\mu\text{g/L}$
- Moderate/ High Chlorophyll a concentrations in water column
 - Up to 54 $\mu\text{g/L}$
- Microcystis and Anabaena sp present
- Microcystin strip test detection (Surface only)
- Microcystin lab analysis detection
- Anatoxin lab analysis just above detection (Surface only)
- No cylindrospermopsin detected
- Nutrient results pending

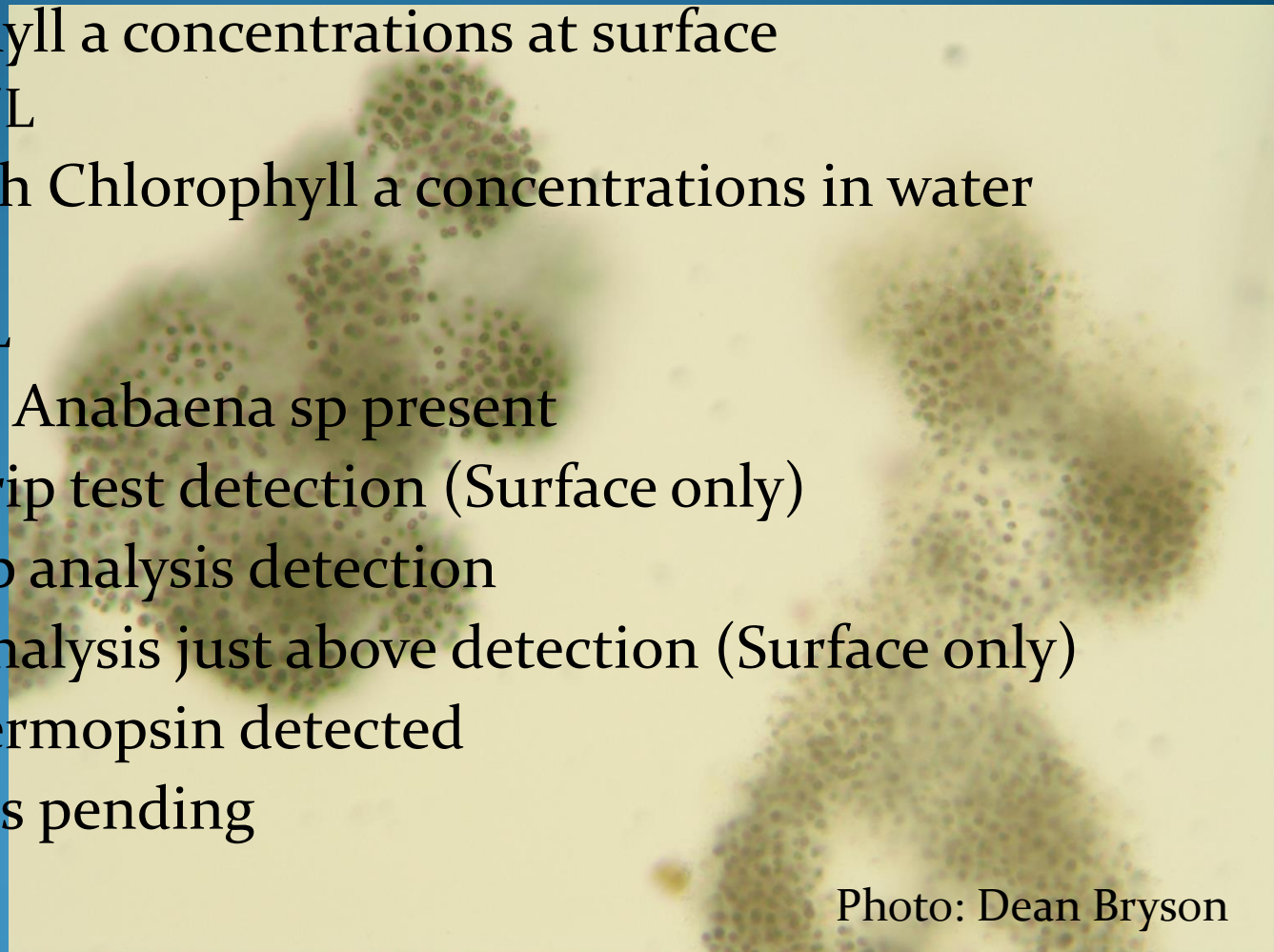


Photo: Dean Bryson

Hopkins Pond

Preliminary Findings

Microcystin Detection

Hopkins Pond 9-01-2015

Microcystins
present > 10µg/l



No microcystins
present



Surface

1-m

ELISA Lab

Microcystin Analysis

- Surface – 4 µg/l
- 1 M – 2.25 µg/l

WHO guidelines:

Low risk < 10 µg/l

Moderate risk 10-50 µg/l

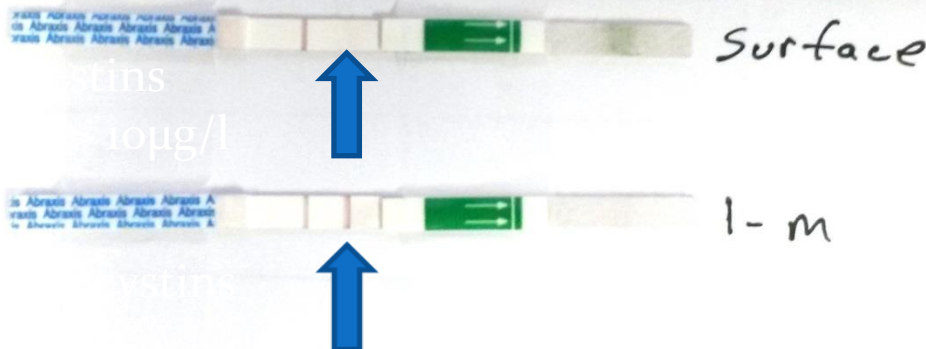
Photo: M. Haberland

Hopkins Pond

Preliminary Findings

Microcystin Detection

Hopkins Pond 9-08-2015



ELISA Lab
Microcystin Analysis

Surface – 11.58
µg/l

1-m – 0.36 µg/l

NO guidelines:

low risk < 10 µg/l

moderate risk 10-
100 µg/l

g/l

Pilot 2: Field Screening with DEP Divisions of Parks and Forestry/ State Park Service

Microcystin Strip Test Kits distributed to all 13 State Parks with freshwater bathing beaches.

- Weekly sampling August – September by Park staff.
- If Strip Test indicated presence of microcystin, BFBM would be alerted to perform additional toxin analysis to confirm concentrations.
- Visual observations of conditions recorded.
- Additional water quality analysis would also be performed.
- Response by Parks in event of high recreational risk.
- No detection ($> 10 \mu\text{g/l}$) from samples collected to date.

QUESTIONS?

Victor Poretti

Section Chief

NJDEP Bureau of Freshwater and Biological
Monitoring

Victor.Poretti@dep.nj.gov

Phone – 609-292-0427